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Indian Standard

STORAGE AND REDRYING OF COVERED ELECTRODES BEFORE USE — RECOMMENDATIONS

UDC 621·791·042·4

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

September 1993 **Price Group 2**

Welding General Sectional Committee, MTD 11

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Welding General Sectional Committee had been approved by the Metallurgical Engineering Division Council.

The success of manual arc welding depends on the quality of the electrode covering (coating) at the time of welding and the satisfactory performance rests largely upon the storage and redrying conditions of the electrodes. With the development of low moisture absorption type coating the importance of redrying has reduced. However, even now large quantity of electrodes are manufactured which are non-low moisture absorption type and therefore this specification will be of much use to the welding industries.

AMENDMENT NO. 1 JULY 1995
TO
IS 13851 : 1993 STORAGE AND REDRYING OF COVERED ELECTRODES BEFORE USE — RECOMMENDATIONS

[*Page* 1, *clause* 3.1(d)] — Substitute the following for the existing matter:

'The relative humidity (RH) condition of storage should be less than 50 percent.'

[*Page* 1, *clause* 3.1(e)] — Substitute the following for the existing matter:

'The ideal storage temperature is 10-15°C above the ambient temperature.'

[*Page* 3, *Table* 1, *Sl No.* (i) (a), *headed under 'Temp* (°C)'] — Substitute '100 ± 10' *for* '135 ± 10'

[*Page* 3, *Table* 1, *Sl No.* (iii), *'Hardfacing* (ii) *Rutile, headed under 'Temp* (°C)'] — Substitute '135 ± 10' *for* '360 ± 10'.

[*Page* 3, *Table* 1, *Sl No.* (vi), *Aluminium, headed under 'Temp* (°C)'] — Substitute '110 ± 10' *for* '180 ± 10'.

[*Page* 3, *Table* 1, *Sl No.* (vi), *Aluminium, headed under 'Time* (*min*)'] — Substitute '120' *for* '60'.

(MTD 11)

Reprography Unit, BIS, New Delhi, India

AMENDMENT NO. 2 DECEMBER 2010
TO
IS 13851 : 1993 STORAGE AND REDRYING OF COVERED ELECTRODES BEFORE USE — RECOMMENDATIONS

[*Page* 3, *Table* 1 (*see also Amendment No.*1)] — Substitute the following in place of the existing Table 1:

Table 1 Temperature — Time Cycle for Redrying of Electrodes
(*Clause* 4)

Sl No.	**Electrode Type**	**Redrying Condition**		**Holding Condition Temp°C**	**Time Exposed**
		Temp (°C)	Time (min)		
i)	General purpose mild steel cored:				
	a) Rutile (IS 814) coated	135 ±10	60	40-45	4 h
	b) Cellulose coated	Not recommended	—	Not recommended	Nil
	c) Basic coated (for extra low hydrogen, that is, less than 5 ml/100 g of weld)	300 ±10 or 360 ±10	120 60	130 ±10 130 ±10	9 h (2 h for Basic Coated only)
ii)	Stainless steel electrode	300 ±10	120	130 ±10	1 h
iii)	Hardfacing:				
	a) Basic	300 ±10	120	130 ±10	2 h
	b) Rutile	100 ±10	60	—	4 h
iv)	Cast iron	135 ±10	60	40-45	1 h
v)	Ni & Ni based	360 ±10	60	130 ±10	1 h
vi)	Non-ferrous:				
	a) Aluminium	180 ±10	60	—	Nil
	b) Copper	230 ±10	120	—	1 h

NOTE – Redrying to be done if the electrodes have remained exposed to humid condition (70 % RH and above) for a time as given above. Whenever the welding consumable manufacturers' recommendation is available for the redrying parameters, those recommendations shall supersede the above requirements.

(MTD 11)

Reprography Unit, BIS, New Delhi, India

Indian Standard

STORAGE AND REDRYING OF COVERED ELECTRODES BEFORE USE — RECOMMENDATIONS

1 SCOPE

This specification covers recommendations for storage and redrying conditions for various covered welding electrodes for satisfactory performance.

2 REFERENCES

The following Indian Standards are necessary adjuncts to this standard:

IS No.	*Title*
814 : 1991	Covered electrodes for manual metal arc welding of carbon and carbon manganese steel
1395 : 1982	Low and medium alloy steel covered electrodes for manual metal arc welding (*third revision*)
5206 : 1983	Covered electrodes for manual metal arc welding of stainless steel and other similar high alloy steels
5511 : 1991	Covered electrodes for manual metal arc welding of cast iron
7303 : 1974	Covered electrodes for surfacing of metal by manual arc welding

3 STORAGE

The essential objectives of proper storing are:

a) to avoid mechanical damages like flux peeling off, electrodes, etc,

b) to avoid getting wet and rusting,

c) to avoid moisture pick up or loosing,

d) to avoid visible defects like smearing of grease, paint, oil, dust, etc,

e) to facilitate easy withdrawal from stores, and

f) to avoid prolonged storage under load.

3.1 Storage Conditions

The general storage conditions of electrodes should be as indicated below unless categorically specified by the manufacturer. The aim of good storage shall always be to achieve the objectives mentioned in **3**.

a) Retain original packing as long as possible.

b) Use racks, pallets or other suitable means to store the electrodes off the floor.

c) Store should be dry and well ventilated, preferably under heated conditions where the humidity is below the general level.

d) The relative humidity (RH) condition of storage should be less than the external conditions (preferred RH is approx 50 percent)

e) The ideal storage temperature is about 40-45°C.

f) It is a good practice for unused electrodes to be returned to the storage so that they are not exposed to unheated and possible damp working area where they can regain moisture.

4 REDRYING

4.1 Redrying depends upon the class of electrode, primarily the extent of moisture the electrode can tolerate vis-a-vis porosity, diffusible hydrogen permissible in the weld deposit etc, as the sole purpose of redrying is to remove the absorbed moisture at a relatively low temperature. Electrodes must always be removed from their packets before being placed in the drying oven.

4.2 In the absence of the recommendations from the manufacturer temperature — time cycle for redrying for various types of electrodes are recommended as follows.

4.2.1 *Mild Steel Cored Electrodes*

4.2.1.1 *Rutile coated* -- Rutile coated mild steel electrodes of IS 814 : 1991 are less susceptible to pick up or lose moisture under normal storing conditions. However, excess moisture or overdrying affects its performance and therefore both should be avoided. Table 1 gives the recommended redrying conditions, but it is not essential. Some heavily coated mild steel electrodes containing iron powder require more stringent drying than is provided in Table 1.

4.2.1.2 *Cellulose coated electrodes* — Cellulose coated mild steel electrodes of IS 814 : 1991 require a definite amount of moisture in the coating to give satisfactory results. If over-dried the organic content will tend to char with consequent loss of arc voltage and running properties. These electrodes, therefore, are normally not redried. However wet electrodes could be dried as per Table 1.

4.2.1.3 *Basic coated electrodes* — Basic coated electrodes mild steel (IS 814 : 1991)/low alloy (IS 1395 : 1982) electrodes are specially baked during manufacturing to ensure that the moisture content is extremely low. On exposure to the atmosphere however, the moisture pick up is correspondingly very rapid and it is essential that electrodes of this type are stored under the test conditions and are thoroughly dried before use. The ideal redrying conditions are where electrodes are well spaced out in an oven in which the atmosphere circulates freely. A longer drying time applies if the air circulation in the drying oven is sluggish or the electrodes are packed closely together. The temperature at which basic coated electrodes should be redried depends on the level of hydrogen considered permissible in the deposited metal. Recommended redrying temperature to reduce hydrogen content to various limits is given in Table 1.

4.2.2 *Stainless Steel Cored Electrodes*

It is expensive to repair a stainless steel weld joint and therefore utmost care should be taken to store and redry stainless steel electrodes correctly. Even slightly damp stainless steel electrodes may give very porous weld deposit. These electrodes of IS 5206 : 1983 should be redried as per Table 1.

4.2.3 *Hardfacing Electrodes*

Hardfacing electrodes of IS 7303 : 1974 generally do not need any redrying. However, if due to improper storage the electrodes have become damp redrying will help restoring its properties. The redrying conditions are given in Table 1.

4.2.4 *Cast Iron Electrodes*

These electrodes of IS 5511 : 1991 type normally do not require redrying if used fresh from original packing. Slight redrying of damp electrodes improves welding characteristics. The redrying conditions are indicated in Table 1.

4.2.5 *Nickel and Nickel Base Alloy Electrodes*

These category of electrodes need thorough redrying for high quality weld joints. The redrying conditions are mentioned in Table 1.

4.2.6 *Non-ferrous Electrodes*

Non-ferrous metals are normally not welded using flux covered electrodes. Some covered electrodes are though available for welding of aluminium, copper and their respective alloys. The flux coverings of aluminium electrodes are hygroscopic and therefore has tendency to pick up moisture. Redrying just before use is a must. The conditions are mentioned in Table 1. The electrodes required for welding of copper and its allots also need redrying as per Table 1.

5 HOLDING

The redried electrodes are prone to regain moisture after their removal from the drying/holding oven and before use. It is, therefore, recommended that the redried electrodes be kept in electrically heated quivers at the site. Only the required number of electrodes for immediate use may be taken out from the quiver. The remaining electrodes at the end of the working day must be returned to the holding oven. The details of holding temperature are given in Table 1.

6 PRECAUTIONS

Certain precautions should be taken while redrying welding electrodes. The significant of them are:

a) The electrodes should not be redried for a very extended time beyond the value indicated in Table 1 unless the manufacturer has mentioned specifically.

b) The minimum redrying temperature must be adhered. Higher temperature could be used if specifically recommended by the manufacturer.

c) Repeated redrying should be avoided as it reduce coating strength. Redrying should not be carried out more than three times.

d) If very wet electrode has to be redried it must first be kept at 100°C for about 15 minutes before being put in the redrying oven. This will avoid cracking on the flux cover due to sudden evaporation of moisture from the coating.

e) The size of electrode (i.e. diameter) also influences temperature/time cycle of redrying. The lower sized electrode will get redried at lower temperature and lesser time. Manufacturer's advice may be sought for revised temperature/time cycle.

f) For hydrogen-controlled electrodes higher temperature of redrying is permissible than the one recommended for the strength level. Higher strength level electrodes require higher temperature of redrying. However, redrying at 350°C for more than 2 hours or beyond 400°C for more than one hour may oxidize ferro alloys resulting in inconsistent chemical composition of the deposit and hence these should be avoided.

Table 1 Temperature — Time Cycle for Redrying of Electrodes

(*Clause* 4)

Sl No.	Electrode Type	Redrying Condition		Holding Condition Temp °C
		Temp (°C)	Time (min)	
i)	General purpose mild steel cored			
	a) Rutile (IS 814) coated	135 ± 10[1]	60	40 45
	b) Cellulose coated	Not recommended		Not recommended
	c) Basic coated (for extra low hydrogen i.e. less than 5ml/100 gm of weld)	260 ± 10 or 360 ± 10	120 60	130 ± 10 130 ± 10
ii)	Stainless steel electrode	260 ± 10	120	130 ± 10
iii)	Hardfacing i) Basic	260 ± 10	120	130 ± 10
	ii) Rutile	360 ± 10	60	
iv)	Cast iron	135 ± 10[1]	60	40-45
v)	Ni & Ni based	360 ± 10	60	130 ± 10
vi)	Non-ferrous			
	- Aluminium	180 ± 10	60	—
	— Copper	230 ± 10	120	—

[1] To be done if the electrodes have remained exposed to humid condition (min. of 70 % RH) for a prolonged time making the coating damp (comparative sound during rattling could be used as guideline to determine dampness) or to have assured radiographic quality weld.

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